USGS

WATER RESOURCES RESEARCH GRANT PROPOSAL

Title: pollution and predator/prey interactions

Duration: 9/1/96 - 8/31/99

Federal Funds Requested: 178,156

Non-federal match: 367,153

Principal investigators: Judith S. Weis, Rutgers University Peddrick Weis, Univ. of Medicine & Dentistry of NJ

Congressional District: NJ 10

Statement of critical regional or state water problem

There is great concern over the effects of toxic chemicals in the northern NJ estuaries and elsewhere. Contaminated sediments in many parts of this estuary may be impairing local biota. Many fish populations have been found to be seriously depleted, and existing fish often have unacceptable levels of contaminants in their tissues. The problem of depletion, while largely due to overfishing, may be also due in part to sublethal effects of pollution, particularly at sensitive larval stages. At low concentrations some toxicants can have subtle effects on behavior, causing impaired feeding and/or anti-predator behavior by larval fish living in a contaminated nursery area. Contaminants in estuarine areas can have serious impacts on larval growth and survival. Larvae are particularly sensitive to environmental contaminants, and the amount of larval mortality may be critical to year-class strength for fishes.

Statement of results or benefits

Our understanding of the links between the vitality of aquatic biota and anthropogenic factors will be improved if we consider effects of toxicants on food webs. These can be altered through effects on predator/prey interactions, which can have effects at the community level. Our study of a "behaviorally impaired" population in a polluted environment (which has poor prey capture and predator avoidance) can serve as a model for understanding effects of contaminants on ecologically relevant behaviors. Altered behavior may also be seen in commercial species of higher trophic levels in contaminated areas. Altered behavior in forage fish such as the mummichog, which is the focus of our study could also have consequences higher up the food chain in commercially important species. If they are able to capture toxicant-exposed (and contaminated) fish more readily than unexposed prey, this will contribute to elevated body burdens in these higher level consumers. If we can identify a particular contaminant or group that is responsible, clean-up and pollution prevention efforts can be focused on it. If water and sediment quality are improved, more larval fishes might survive due to improved prey capture and predator

avoidance, and be recruited into the adult population. It is possible that some current fishing restrictions due to depletion will become unnecessary in the future if polluted areas are remediated and water and sediment quality in estuaries is improved. This could allow more larval fishes to survive and be recruited into the adult population.

While there have been many lab studies of behavioral effects of individual toxicants, there is little knowledge of the effects of the complex mixtures of toxicants that occur in the environment. This research is aimed at identifying which particular contaminants are primarily responsible for the "behavioral biomarker"(reduced swimming activity, impaired prey capture ability and capture efficiency and reduced predator avoidance) and is also designed to learn the possible genetic vs environmental contributions to observed behavioral differences among the populations.